Blockchain based E-Voting System

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Abstract: **Elections can be an important event during a normal democratic process but become a major part of society the world does not trust its electoral system which is deeply troubling to democracy. Even the biggest in the world democracies like the Republic of India and Japan still suffers from a flawed legal system. Vote theft, EVM hacking (electronic voting machine), electoral fraud, and square measurement booth are significant issues in the current electoral system. during this process, we tend to resolve these major problems within the electoral process and attempt to propose the E-voting model which may solve these problems.**

Keywords**: blockchain, electronic voting system, e-voting, evm, decentralized system.**

I. INTRODUCTION

Across democracy, electoral security is an issue national security. The computer protection field is ten years old studied the possibilities of electronic voting systems, by the goal of reducing the cost of holding national elections. From the beginning of the democratic election of candidates, the voting system is based on pen and paper. Change traditional pen and paper system with new options the system is important to limit fraud and to have a voting process traceable and verifiable.[1][2]

The security community has seen electronic voting machines as defective, especially due to physical security issues. Anyone who has a physical disability. Access to such a machine can be used to sabotage it.as a result, all votes cast on the machine will be affected.

Enter blockchain technology. A blockchain is a distributed, immutable, incontrovertible, public ledger. There is distributed control over who can append new transactions to the ledger. Any proposed "new block" to the ledger must reference the previous version of the ledger, creating an immutable chain from where the blockchain gets its name, and thus preventing tampering with the integrity of previous entries. Blockchain technology has been applied and implemented successfully by different authors in varied areas like IOT, Health, Business and food chain supply, Data Management, and Integrity Verification, Decision Making etc. The use of block chain has been reported by many in varied fields. [3] [Sharma et al, 2022] have discussed the Myths, Realities and Future related to block chain. Decision making forms an important basis in businesses. The significance of decision making, and its use has been demonstrated by [4] [5] [6] [7].

Blockchain technology is thus thought of by several, together with America, to be the best tool, to be accustomed to producing the new fashionable democratic ballot method.

II. LITERATURE SURVEY

Survey Existing system

The voting sector is being developed by the following enterprises and organizations, which were founded but mostly formed in the recent several years. All of them have a strong belief in the blockchain network's ability to provide transparency. The system's various internet platforms, as well as the technology that was employed to construct it. The scalability of currently existing blockchain-based voting systems is a challenge. On a small scale, these systems can be used. Even so, because they utilize contemporary blockchain frameworks such as Bitcoin, Ethereum, Hyperledger Fabric, and others, their systems are inefficient for handling millions of transactions at the national level. The current scalability study of well-known blockchain networks. The scalability issue develops due to blockchain value suggestions; as a result, changing blockchain settings is difficult. It is insufficient to increase the block size or reduce the block time by lowering the hash difficulty to scale a blockchain. Each technique reaches a limit before it can handle the volume of transactions required to compete with firms like Visa, which processes 150 million transactions each day on average. According to a poll conducted by Tata Communications in 2018, 44% of organizations employed blockchain in their survey, which relates to general difficulties originating from the adoption of new technologies. From an architectural standpoint, the unresolved scalability issue appears to be a barrier to blockchain adoption and practical implementations. "Blockchain-based systems are comparatively slow," according to Deloitte Insights. The slow transaction speed of blockchain is a serious worry for businesses that rely on high-performance legacy transaction processing solutions." The public became aware of scalability difficulties in 2017 and 2018 as a result of major delays and excessive charging on the Bitcoin network, as well as the controversial Crypto programmer, which clogged the Ethereum blockchain network (a network that thousands of decentralized applications rely on). [9]

1. Follow My Vote

It's a startup that features a secure online voting infrastructure built on the blockchain, as well as the capacity to audit polling boxes in real time to track democratic progress [10]. This platform allows users to vote for their preferred candidate while remaining anonymous. It can then use their identification to physically open the vote box, locate their ballot, and verify that it is right, as well as that the election results have been mathematically shown to be accurate.

2. Voatz

This startup created a blockchain-based smartphone voting system that allows people to vote remotely and privately while also verifying that their votes were counted correctly [11]. Voters identify their applicants and themselves on the application and provide verification by an image and identification, which includes biometric confirmation such as fingerprints or retinal scans.

3. Polyas

It was formed in 1996 in Finland. The startup uses blockchain technology to deliver an electronic voting system to the public and private sectors [12]. In 2016, the German Federal Office for Information Security certified Polyas as secure enough for electronic voting applications. Polyas is used by a lot of big firms in Germany to run their electronic voting systems. Polyas today has customers all around the world, including in the United States and Europe.

Limitations of Existing system

However, recent major technical challenges relating to e-voting systems are not restricted to secure digital identity management. Any potential citizen ought to be registered to the electoral system before the elections. Their data ought to be in a digitally processable format. Besides, their identity data ought to be unbroken and non-public in any involving info. The ancient E-voting system might face the following problems:

- Anonymous vote-casting
- Individualized ballot processes
- Ballot casting verifiability by (and only by) the voter
- High initial setup costs
- Increasing security problems
- Voting delays or inefficiencies related to remote voting

III. DESIGN AND IMPLEMENTATION

Implementation

An overview on the implementation:

1. Admin will build a voting instance by launching/deploying the system on a blockchain network (EVM), then an election instance and begin the election with the election details provided in (including candidates for voters to vote).

2. The likely voters then join to the same blockchain network and register to vote. When users successfully register, their information is transmitted to/displayed on the admins' panel (i.e. verification page).

3. The admin will next verify that the registration information (blockchain account address, name etc) is correct and matches his records. If yes, the admin accepts the registered user, allowing them able to participate and vote in the election.

4. Following admin permission, the registered user (voter) votes for the candidate of interest (from the voting page).

5. The admin finishes the election after a certain amount of time, depending on the magnitude of the election. As soon as that happens, the voting is closed, and the results are posted at the top of the results page, declaring the winner.

The overall implementation is achieved by building various modules and submodules listed below:

System Modules

Modules used in Website are as below:

- Voter Module
  - Registration and Login

➔ Voter registers for verification purpose and have the authorization to cast vote which is being approved by administrator.

  - Casting Vote

➔ After Verification, Voter has been granted with proper authentication for casting votes to any candidate, they wish to go

forward with which will reflect in the blockchain node mapping.

- Admin Module
  - Admin Login

➔ Logging into as administrator using a singular account with a unique private key attribute for security purposes.

- Add Candidate

➔ Adding candidates for voters to select as their representative and storing all the candidate details including candidate headers and candidate's slogan for a particular campaign into a mapping structure into the blockchain using the contract initialized prior to the starting election using truffle framework.

- Start/End Election

➔ Starting and Ending election data is recorded in as a Boolean value into the contract space in nodes and then used by the web3 framework for checking the existence of election.

- Voter Verification

➔ Voter is being verified by the admin after successful registration by the voter. All the credentials are hashed and securely stored in the chain of nodes with a mapping key (verified) stating if the voter address is verified or not.

- Election Module
  - Creating of Smart Contract

➔ Smart contract stores all the functionality which are called upon when certain conditions are met. These functionalities are directly configuring how the voting chain should interact with users credentials.

➔ Some Key Features: Adding Candidates, Get Election Details or Admin details, Adding Voters, Storing Votes in chain of nodes etc.

- Storing Voter Credentials

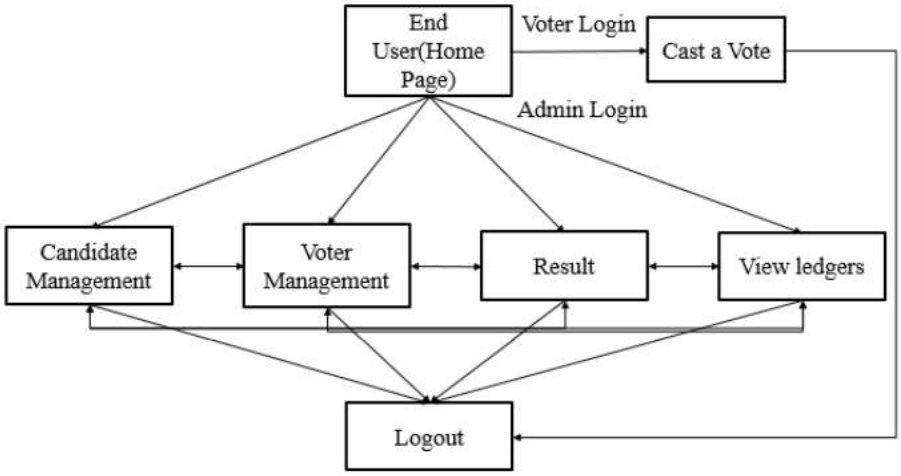
➔ All the Voter credentials are stored in the chain with proper hashing into a structure having multiple data fields as Voter Address, Name, Boolean Field is verified or not, has voted or not etc.

- Storing casted votes onto chain

➔ Votes are directly added to the specific candidates mapping for no distorted efficiency for retrieval of votes.

- Result Module
  - Display Live Result after end of Election

Block Diagram



Implement: Blockchain Initialization

Fig 1: Truffle migrate and deploy for smart contract execution

Testing

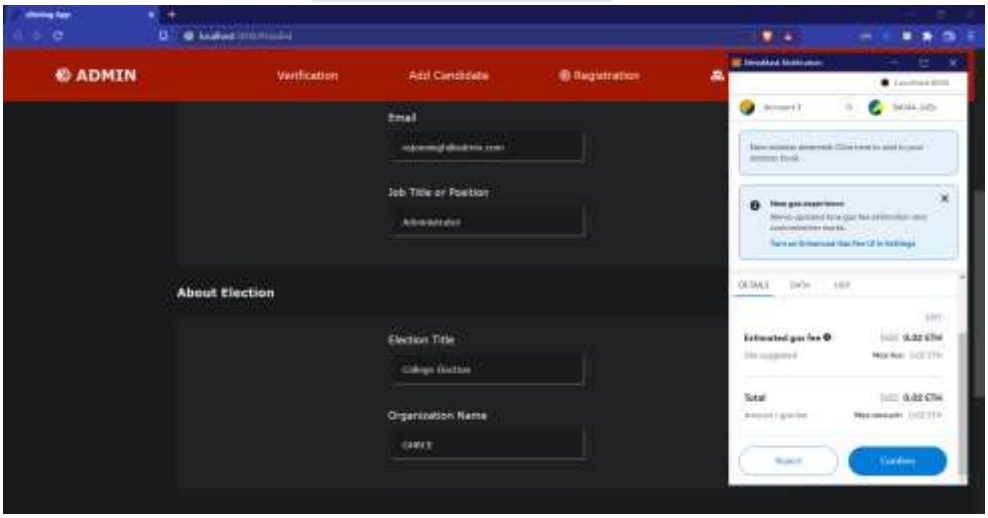


Fig 2: Initiate Election

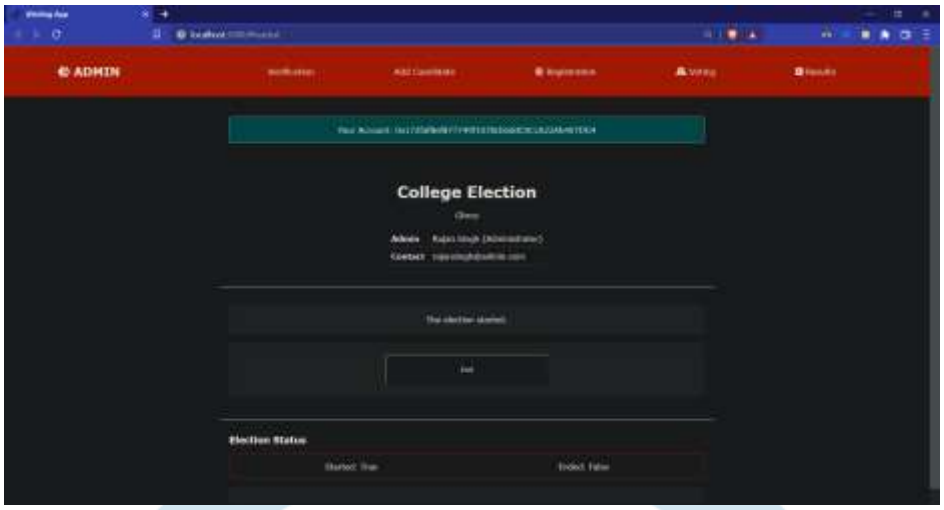


Fig 3: Election Initiated with Administrator's Wallet Credentials and Contact Details.

Fig 4: Addition of Candidate

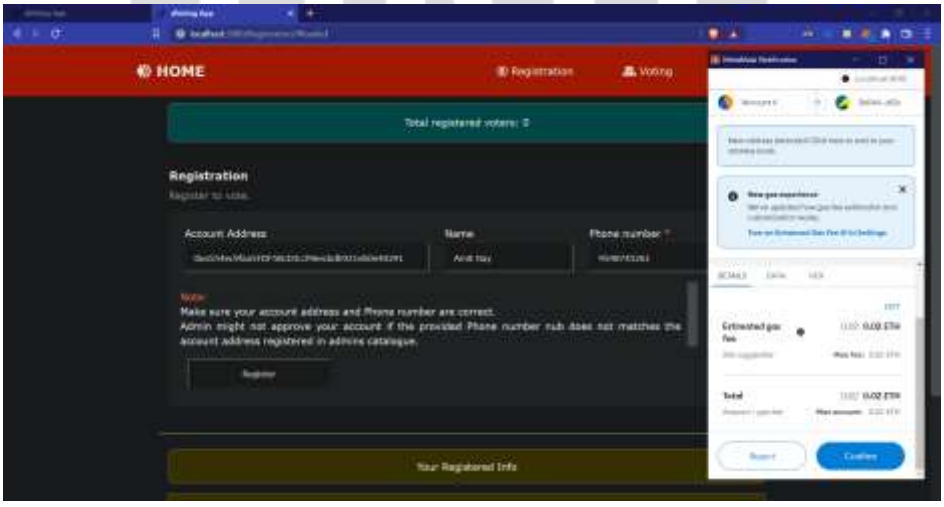


Fig 5: Voter Registration

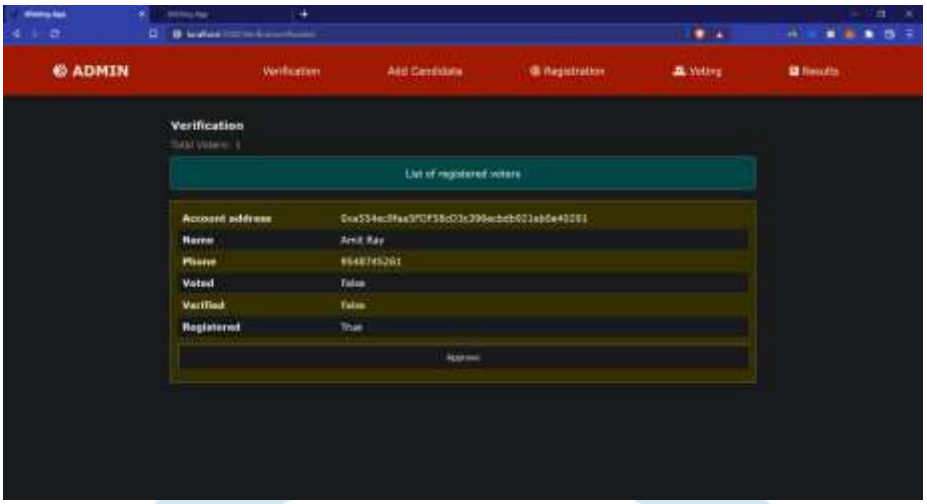


Fig 6: Voter Verification

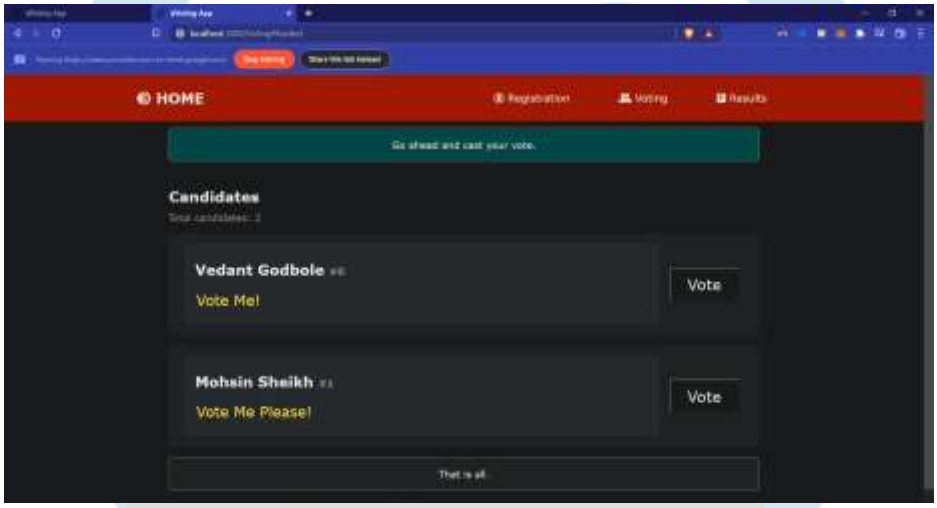


Fig 7: Voter Casting Vote

Fig 8: Election Results on hold until end

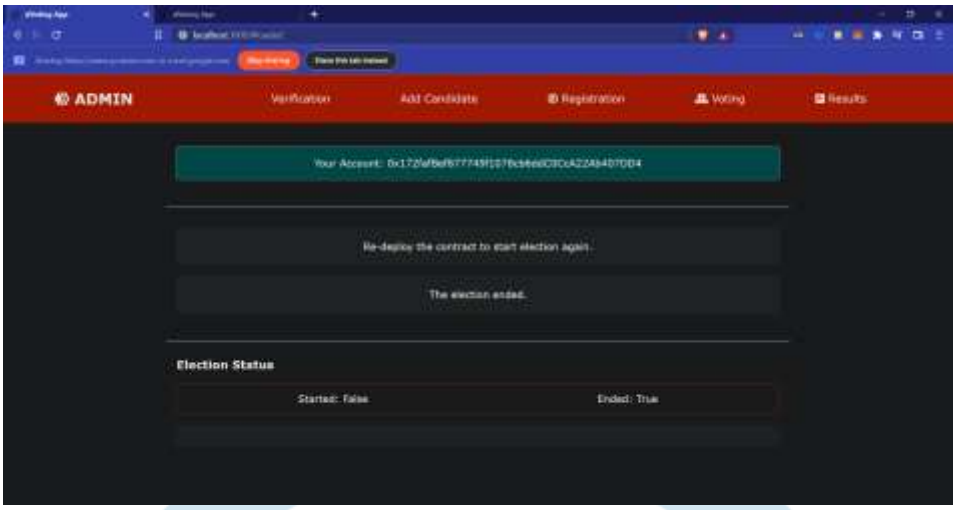


Fig 9: Election Ended

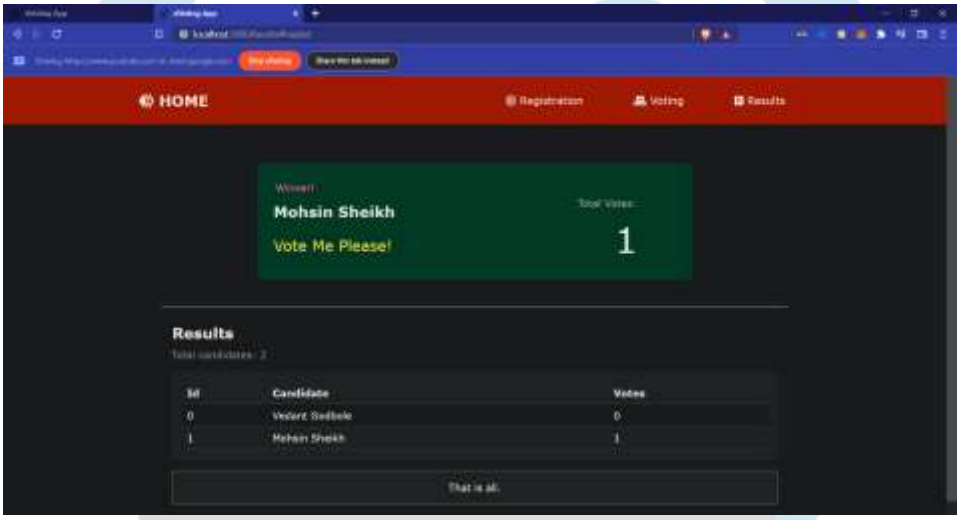


Fig 10: Results declared

CONCLUSION

The idea of changing digital voting systems to make the electoral process cheaper, faster, and easier, is a compelling one in modern society. Making the election process cheaper and soon, it makes it common in the eyes of the voters, to remove a certain power barrier between the voter and the elected official and puts a certain amount of pressure on the chosen one. It also opens the door to a more specific form of democracy, to allow voters to express their will with their debts as well suggestions.

In this paper, we have introduced an alternative, blockchain-based an electronic voting system that uses smart contracts to operate safe and economical elections during the verification of voter privacy. This paper tests the ability of blockchain technology and its quality within the e-voting theme. The blockchain will be publicly available and it is distributed in a way that no one else can be able to destroy it.

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